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The Necessity of Developing the Scientific and Technical Bases of Art

by EDWIN M. BLAKE

(Presented at the Eighth Annual Meeting, New York,
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IF one whose chief work has been the study and teaching of mathematics and some of its applications to engineering may venture an opinion on certain matters connected with art, I should like to give some reasons for the necessity of developing its scientific and technical bases, and offer a suggestion for procedure along that line.

Among the things which impress one in the general situation at the present time are that the winning of the war was largely the result of coöperation and original investigation, and that the lessons gained in the war should not be lost to the future. Coöperation occurred between the governments involved, between the individuals of the several nationalities, and between the members of trades and professions which had seemed far removed in their interests. Reports tell of no end of original investigations directed toward the solution of specific problems with a not inconsiderable grist of discoveries and inventions ranging from the "Liberty Motor" to the most terrible of toxic gases. We are entering a period in which political Europe will be remodeled, and in which social and economic conditions not only there but also with us may be considerably changed. The war has served to make us aware that we were dependent on outside sources for many very essential material things which we should as far as possible produce ourselves. Some, like the coal-tar dyes and medicinals, optical glass and table china, are within our ability to supply if only effort is directed toward the result; and such effort is being made with constantly gaining strength. The lack of other materials,

such as platinum, tin, and potash, not thus far discovered in sufficient quantity in the United States, prevents our complete economic independence; but even here the collection of all available supplies, the elimination of waste, and the use of substitutes when possible, has served to ameliorate the scarcity.

It would seem that art in its field should not be oblivious to the lessons indicated—the desirability of coöperation, the value of scientific investigation, and the necessity of striving for independence. To be sure, many papers have of late discussed the new conditions. It is proposed to have artist's materials manufactured in this country. The National Association of Decorative Arts and Industries has been organized. And there are calls for better art education and for better designs for our art products. All these are very encouraging signs. Are, however, all aids being developed? Perhaps they are; but one misses any very specific reference to some of them: the scientific and technical bases of art, especially the former. It is as if we had schools for the teaching of chemistry, museums filled with samples and apparatus of historic interest, means for manufacturing chemical products, a sales department for handling the output, and a well organized bureau of propaganda for making the products popular with the masses, but lacked just one thing—any provision for the study of chemistry itself, for attacking those theoretical problems which would ultimately lead to better manufacturing methods, greater diversity of products, more useful fields of application for them, and gradual change in the subjects of school instruction. Any one can readily ascertain that chemistry does not lack this one essential, but that its workers are constantly clamoring for and providing still greater facilities for research.

It would, of course, be unjust to affirm that the art interests in this country are entirely oblivious to the study of its underlying theoretical problems, but it impresses one that a great deal more might be done, and with no little benefit to all other phases of art development.

In speaking of art I have in mind the visual fine and decorative arts, that is, those which make their appeal through the eye and which do not involve the use of language—that is, excluding literature, poetry, the drama, and music. The visual fine and decorative arts are capable of further classification into static, that is, drawing, painting, etching, modeling and sculpture; and kinematic, including art dancing, color music, and analogous arts. The problems connected with the visual static arts may conveniently be grouped about the following four topics:—

FIRST. The materials and methods of artistic fabrication. This would include the chemistry and physical properties of dyes and pigments (especially their fastness to light), the procedure of laying paint on canvas, the various processes of the craftsman, and the operations in commercial manufacture, also questions relating to the preservation and restoration of works of art.

SECOND. The motives used in design and the procedures of composition. This includes the sources of motives used in designs: naturalistic motives from plant and animal life, from man and structures reared by him, from his history and social relations, and abstract motives furnished by geometry.

THIRD. The psychology of art creation and appreciation. The questions arising here of what art is, how created, why enjoyed, whether beauty has absolute standards or is relative to time, place, and the individual, are, we believe, among the most difficult, the most important, and least considered in connection with art.

FOURTH. Social and economic relations of art. Under this heading would come questions relative to the training of art workers, to the spread of knowledge and appreciation of art, to the organization of art industries and sale of their products. Here might be grouped also questions concerning the history of art.

Of course no one of these four topics can be sharply separated from the others, nor can problems

under one be solved without considering the effects on the others.

Turning now to the kinematic visual arts, I pass over art dancing to say a word on color music and analogous arts—that is, those which would involve the showing of geometric plane or space figures in motion. The questions involved in their study might be grouped under four topics, in much the same manner as those given above, but with some important modifications. Under the first topic would have to be included apparatus for the performance of compositions, kinematic compositions being in this respect analogous to music. Under motives would have to be included temporal sequences or rhythms, similar to those of music, and the psychology of composition and appreciation must take into account the elements of time, motion, and rhythm.

The present paper would urge the advisability of studying for the static arts: the problems of physics and chemistry coming under the first topic, the abstract motives of design which geometry may be able to suggest, and, above all, the psychological questions which fall under the third topic.* The scientific consideration of color music and the possible arts of mobile abstract form, is at present of little practical importance since these have been scarcely more than suggested. However, such studies might serve to show the conditions under which such arts might be developed and the limitations to which they are of necessity subject, and thus lead the way to their earlier introduction—were indications of their possible success forthcoming.

Assuming, then, that there are important questions, such as those suggested above, which merit careful investigation by scientific methods, are the investigations being carried forward by proper methods and with sufficient activity? We think not, one difficulty being that there is no society in the country devoted to the study of the scientific foundations of art, though it would seem that the College Art Association might add this to its other fields of usefulness.

To be sure, the Association was established primarily for furthering the teaching of art, but what can be more conducive to efficient and forceful instruction than the placing of art as far as possible on a rational basis? Further, what body of men and women engaged in art work in the United States is in as close touch with the leaders of science as the members of the College Art Association, who number among their friends and colleagues the great majority of the scientific thinkers and investigators of the country?

And this last is by no means an unimportant consideration, for it would seem to afford an opportunity for attaining a very essential end—coöperation between college art teachers and scientists. Hearty coöperation between interested workers in the two fields could hardly fail to lead to a clearer statement of fundamental problems and to a concentration of effort towards their solution. And no country in the world is, perhaps, better fitted to attain a high place in these matters than our own, were the necessary organization provided and interest aroused. We are among the leaders in psychology, physics, and geometry, and the stimulus to chemistry since the beginning of the war has carried us far. Unfortunately, little of this science has been directed to the service of art, though it should be if we are to attain success. We call in the physician to regulate our diet, the lawyer to solve our legal problems, the plumber to repair a frozen water pipe, and why not the chemist, the physicist, and the psychologist to help with the chemistry of pigments, the theory of color, or the study of the mental processes following vision?

In place of coöperation what do we find? Well, as the writer sees it—confining the attention to psychology, which may serve as an index to the whole—we have on the one hand the *American Journal of Psychology*, the *British Journal of Psychology*, and other like publications—in the English language and available in our libraries—publishing each year a few papers describing investigations bearing on the psychology of art. On the side of art we have the

Studio, and like journals, and now and again a book which discuss matters of art theory, but usually in a vague and untechnical manner; that is, the language used fails to convey clear and unequivocal meaning, the arguments lack definite conclusiveness, and wide generalizations are affirmed on insufficient evidence. Now, each of these two kinds of publications goes its way ignoring the existence of the other. It would seem that the editors of journals of psychology do not find the theories of writers on art very illuminating and perhaps the latter may find the papers of the psychologist dull reading—if in fact they ever hear of them.

The speaker is a firm believer in the necessity of thorough preparation for the solution of scientific and technical problems. Once in a long while a man may make an important discovery in a subject he is little acquainted with, but these cases are the rare exceptions. Prof. Ames of Johns Hopkins University has recently expressed this idea as follows. "One government board with whose activity I am familiar has had submitted to it in the course of the year 16,000 projects and devices proposed by so-called inventors; of these only five had sufficient value to deserve encouragement." "The point I wish to emphasize is that the ability and knowledge required in waging this war successfully are not those possessed by any body of men except those with a profound knowledge of science and of scientific method. The problems are too complicated." (Science, October 25, 1918, p. 403.) Also, lest it be claimed that science and scientific methods, though very essential to science, do not apply to research in other lines, such as ethics and religion, art and aesthetics, let me quote Prof. Lewis of the University of California. "Religion may and should inculcate righteous righteous zeal, but this impulse alone, no matter how intense and sincere it may be, does not necessarily enable us to distinguish between right and wrong, and may even make us the more zealous in wrong-doing. To make an ethical decision we must see all the relations of the subject to ourselves and our fellow men, and see them disinter-

estedly, without prejudice and without regard to authority and tradition. This is a mental attitude which is essentially scientific and which is consistently developed by scientific studies alone." (Scientific Monthly, November, 1918, p. 438.)

Applying the above to art we see no good reason for assuming that, because a man has become a great painter of landscapes, or has achieved distinction as a craftsman in silver, or has successfully guided innumerable classes through the mazes of the history of painting, he is of necessity a great authority on the physics of light and color, or the psychological principles underlying art appreciation. In coöperation with the scientist, however, the trained eye of the painter, the subtle taste of the critic, the clear memory of the museum worker stocked with innumerable art forms, and the deep knowledge of the rise and decay of cultures possessed by the authority on history, are invaluable as furnishing the concrete material with which to make experimental investigations.

The justification of the principles and procedures of art, as far as may be possible, by the results of carefully conducted and impartially interpreted experiments, should have the effect of arousing and maintaining an interest for art among the more conservative, intelligent, and rational part of the population, as against the impulsive, the emotional, the mystic, and the neurotic; not that emotion of the proper kind would thereby be excluded from art, since expressiveness stimulative of emotion is its very foundation, but that the emotions induced by objects of art would rest on a more secure, reasoned, and intellectual basis. And we believe that thus our art production and criticism would be more able to advance against foreign competition and withstand the worst manifestations and tendencies of domestic production.

Were it decided to attempt to gain the coöperation of scientists and technologists in the study of art problems the College Art Association might include in its programs:—

FIRST. Summaries of those applications which

science has already made to art, such as the theory of color vision, vegetable and chemical dyes and pigments, or some of the scientific aspects of ceramics.

SECOND. Reports and discussions of recent scientific investigations which appear to have a bearing on art problems, such as "Experiments on a Possible Test of Aesthetic Judgment of Pictures" on the basis of a paper with this title in the *American Journal of Psychology*, July, 1918. It would undoubtedly add to the interest of these reports and discussions, and the summaries above mentioned, if in part, at least, they came from some of our scientific friends.

THIRD. Digests, reviews, and criticisms of current scientific, technical, and art literature which treat of fundamental problems. This might be made a feature of the *Bulletin*, and thus do for art what is being done for so many other lines, and on which so much of the possibility of coördination of effort depends.